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Granular activated carbon (GAC) is used primarily in water and air treatment systems, for sorption of organic contaminants from the aqueous or gas phases. Contaminants are adsorbed to the outer surfaces of the GAC particles and to the inner surfaces of micropores within the particles, and are also slowly absorbed by diffusion into the particle interiors. The sorption mechanism consists of attachment of organic compounds to carbon by a weak electrical attraction between the oppositely-charged ends of adjacent molecules, known as Van der Waals bonding. GAC sorption is an equilibrium process; i.e. the sorbed contaminant concentration increases with the dissolved concentration, and contaminants can desorb if the dissolved concentration of influent water decreases.

Organoclay (OC) is used in water treatment systems for removal of oil from wastewater. OC is manufactured by replacing cations in layered clays such as bentonite with cationic organic compounds such as quaternary ammonium compounds (QAC), to create an organic phase along the surface of each layer in the molecular lattice. The QAC molecules also act to increase the spacing between the layers, improving contact with permeating fluids. The compounds in sorbed waste oil do not form bonds with the clay molecules; instead they partition into the organic phase within the OC lattice, mixing freely with it in the same way that miscible liquids mix to form a solution. The sorbed mass of oil can exceed the QAC mass, and can also exceed 50% of the original OC mass. Column studies at University of Texas showed that contaminants do not desorb from OC, even when the influent concentrations are decreased.

Waste water containing oil is typically treated first with an OC filter to remove oil, and finally with a GAC filter to "polish" the water, removing the remaining dissolved concentrations. OC is very effective for sorbing dissolved contaminants, but not substantially more effective than GAC. GAC is not effective for sorbing oil; this is partly because of sorption mechanism, but primarily because oil blocks the GAC pores preventing contact of contaminant molecules with adsorption sites. Studies by Biomin Inc. showed that OC generally can sorb 7 times as much oil as GAC. Current lab testing data and experience with water treatment systems indicate that GAC can be an effective amendment to sediment caps intended to intercept contaminated porewater, but OC should be used where sediments contain oil.

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